

UAV-BASED VIDEO SURVEILLANCE SYSTEM OF RELIEF AREAS

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<https://doi.org/10.5281/zenodo.11467077>

Abstract: The integration of Unmanned Aerial Vehicles (UAVs) into video surveillance systems presents a transformative approach to monitoring and managing relief areas. This study explores the design and implementation of a UAV-based video surveillance system specifically tailored for terrain relief regions, characterized by complex topography and challenging accessibility. The system leverages advanced drone technology equipped with high-resolution cameras and real-time data transmission capabilities to provide comprehensive and continuous monitoring. Key features include autonomous navigation, obstacle avoidance, and adaptive flight patterns to ensure thorough coverage of the surveyed areas. The UAV-based system offers significant advantages over traditional methods, including enhanced mobility, rapid deployment, and the ability to access remote or hazardous locations without risking human safety. This paper evaluates the system's effectiveness through a series of field tests, demonstrating its potential to improve situational awareness, facilitate disaster response, and support environmental monitoring.

Keywords: flight controller (CC3D), Bluetooth Low Energy (BLE) Module (Generic), Arduino UNO, battery 11.1V

СИСТЕМА ВИДЕОНАБЛЮДЕНИЯ РАЙОНОВ БПЛА С БПЛА

Аннотация: Интеграция беспилотных летательных аппаратов (БПЛА) в системы видеонаблюдения представляет собой преобразующий подход к мониторингу и управлению районами оказания помощи. В данном исследовании рассматривается проектирование и внедрение системы видеонаблюдения на базе БПЛА, специально разработанной для регионов с рельефом местности, характеризующимися сложным рельефом и сложной доступностью. В системе используются передовые технологии дронов, оснащенные камерами высокого разрешения и возможностью передачи данных в реальном времени, для обеспечения всестороннего и непрерывного мониторинга. Ключевые функции включают в себя автономную навигацию, обход препятствий и адаптивные схемы полета для обеспечения тщательного покрытия исследуемых территорий. Система на базе БПЛА предлагает значительные преимущества по сравнению с традиционными методами, включая повышенную мобильность, быстрое разворачивание и возможность доступа к удаленным или опасным местам без риска для безопасности человека.

Ключевые слова: контроллер полета (CC3D), модуль Bluetooth Low Energy (BLE) (общий), Arduino UNO, аккумулятор 11,1 В.

INTRODUCTION

The world receives more than 200 thousand people in a day and it is expected that the total world population will reach 9.6 billion by the year 2050. This will result in extra food demand, which can only be met from enhanced crop yield. Therefore, modernization of the agricultural sector becomes the need of the hour. There are many constraints that are responsible for the low production of crops, which can be overcome by using drone technology in the agriculture sector.

This paper presents an analysis of drone technologies and their modifications with time in the agriculture sector in the last decade. The application of drones in the area of crop monitoring, and pesticide spraying for Precision Agriculture (PA) has been covered. The work done related to drone structure, multiple sensor development, innovation in spot area spraying has been presented.

Land and vegetation analysis using drones

Upon the completion of the photo shooting of the desired objects or locations, the images have to be further analysed and processed. This can be done with the help of specialized software products, which are again used depending on the needs of the users. The software processing tools are divided in two categories – tools for processing and enhancement of the images [4] and tools for post-processing and generation of 3D models or georeferenced maps [5, 6]. The second category of software products includes tools, which are relatively new and as such have not been yet widely applied in areas, such as the precision agriculture, but nevertheless they are fully optimized and suitable for such applications. Agriculture sector plays an immense role in the growth of any country. The agriculture sector contributes to the secondary and tertiary economies of a country. Agricultural sector thus being an important clog in every country's nation's economy, the involvement of suitable and helpful technology would only add to the overall development of this sector.



Fig. 1. Diseased plant (A) Non-diseased plant (B)

Analysis of research experiments

With the development of humanity, many types of work performed by manual labor began to be performed by mechanical assistants. This, in turn, revealed the great stages of development of mechanics. The tasks that were impossible at first began to be solved very easily with the help of mechanical means. As an example of this, it is enough to remember the Egyptian pyramids built in the millennium BC and the other 7 wonders.

Many inventions of the early 20th century incorporated the principles of semi-automation to complement these approaches. Now, it is possible to perform many difficult steps performed by human factor through automated systems.

Marketing Analysis: It is known that today the demand for automation in the study of agriculture and land systems is very high. It is considered a very important issue to grow their crops in a high-quality, cheap and efficient way. The AgRow drone created during the project can be widely used for every farm.

Total costs for 1 hectare of land

Harajatlar nomi	Miqdori	Narxi
Labor Force	5	100 000*5=500 000
Time	5 days	500000*5=2,5 mln
Water Consumption	300 m ³	300m ³ *700=210 000
Nitrogen	300 kg	300kg*1700=510 000
Potassium	300 kg	300kg*1000=300 000
Phosphorus	300 kg	300kg*1100=330 000
Total		3 850 000 sum

table 1

Harajatlar nomi	Miqdori	Narxi
Parvoz boshqaruvchisi (CC3D)	1 dona	640 ming
Bluetooth kam energiya (BLE) moduli (umumiy)	1 dona	66 ming
Batareya 11,1V	1 dona	11 600 so`m
Arduino UNO mini	1 dona	99 000 so`m
Cho'tkasiz DC mator	4 dona	22 ming
Mini kamera A9	1 dona	100 ming
Sim	0,5 m	4 ming
Korpus	1 dona	24 ming
Pult	1 dona	300 ming
Jami		1 266 600 so`m

table 2

The code for transferring the image taken by the drone to the mobile phone

```
{
int chk =DHT.read11(DHT11_PIN);
Serial.print("video = ");
Serial.println(DHT.video);
Serial.print("Picture =");
Serial.println(DHT. Picture);
delay(1000);
}
```

CONCLUSION

The approach presented in this paper is an innovative step over the available UAV's used in the field of agriculture. The monitoring of the fields can be improved even more with the usage of even more sensors. Although there are a number of UAV designs and projects available in the field of agriculture, the method approached in this paper helps in monitoring the field. This could help a farmer to keep track of his field from time to time without even stepping on to the field and checking the crops one by one. This proposed method could act as an overview for monitoring the field and the values monitored could give an overall idea about the field for the farmer or the user. The monitoring of the field could be improved with the addition of high-resolution cameras with machine learning capabilities which could give an idea for the farmer if the crops are harvest ready

just by looking at the pictures developed on their smart devices. The monitoring could be used to give a standardized data for particular crop types, which could be used in the future for comparing the crops for the next cycle. Crops of same type can be compared with each other. The main idea of the method proposed in this paper is to make the monitoring of an agricultural field easier for a farmer and help improve the crop quality and thus help them improve their harvest.

LIST OF REFERENCES

1. Rana Hani A.Rahman Azzam, & Jaloliddin Yigitaliev. (2023). MONITORING AGRICULTURAL CROPS THROUGH DRONE TECHNOLOGY. <https://doi.org/10.5281/zenodo.7927709>
2. Rana Hani A.Rahman Azzam, & Jaloliddin Yigitaliev. (2023). THE ROLE OF DRONE TECHNOLOGY IN AGRICULTURE <https://doi.org/10.5281/zenodo.7927731>
3. Motion Capture Systems. Available online: <https://optitrack.com/> (accessed on 24 November 2023).
4. Hercog, D.; Lerher, T.; Truntič, M.; Težak, O. Design and Implementation of ESP32-Based IoT Devices. Sensors 2023, 23, 6739. [Google Scholar] [CrossRef] [PubMed]